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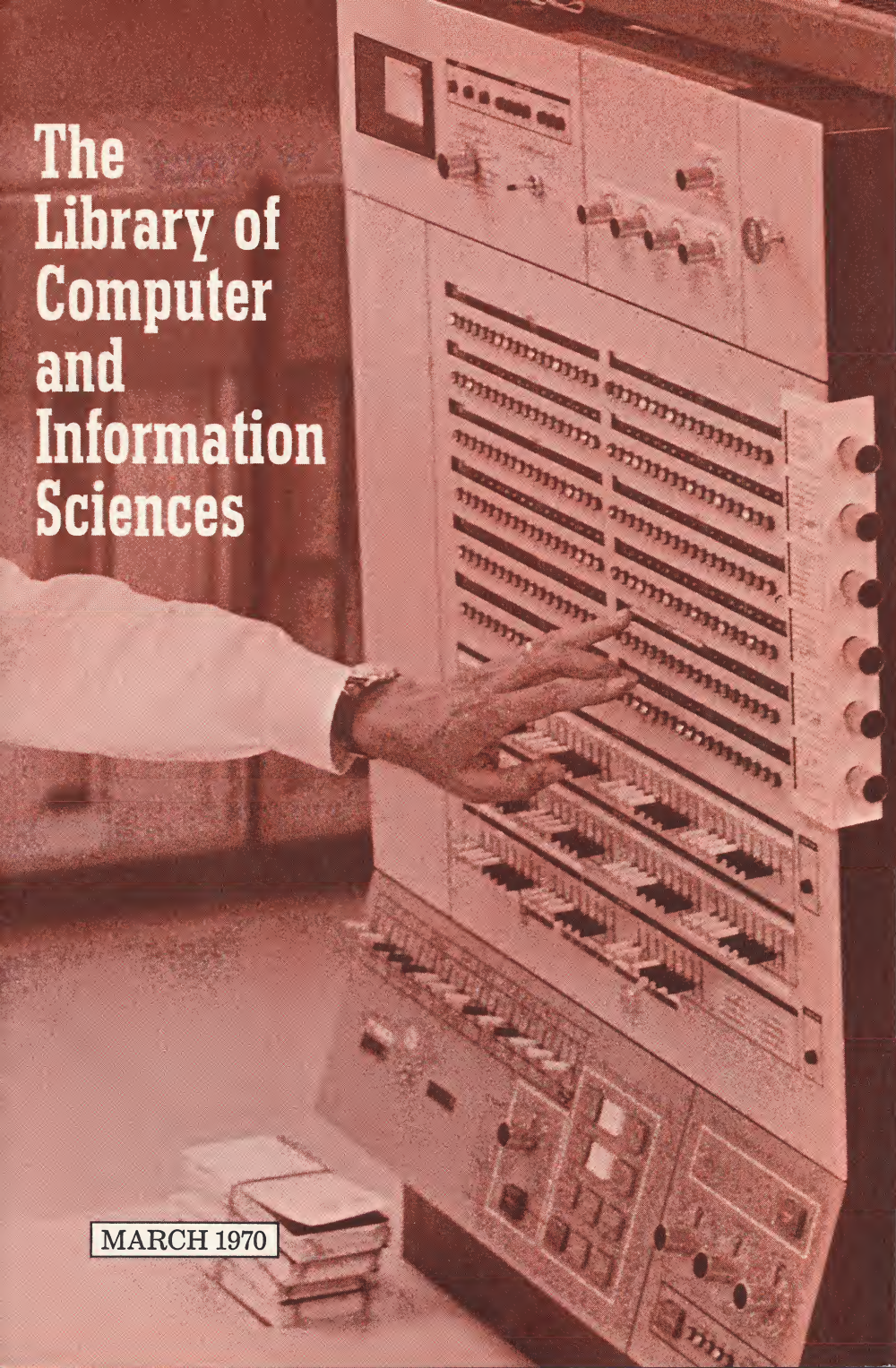
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The Library of Computer and Information Sciences

MARCH 1970



a message from the Director
of the Library of Computer and Information Sciences

Although the "computer revolution" is still in its early stages, we have already reached a point at which many persons have access to one or more computers. This includes very large numbers of practicing professional and business people, almost all college students, and many high school students.

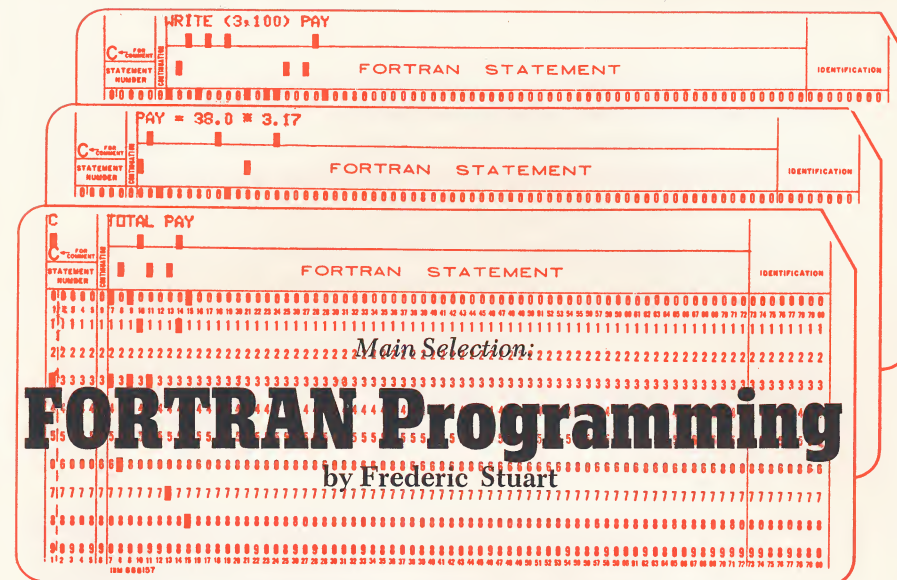
There are at present more than 200 different computer models in use. Nearly 80 per cent of these are provided with FORTRAN compiler programs which enable the computer to translate from FORTRAN (which uses English and basic arithmetic notation) to its own "machine language." Although machine languages are highly individual for each computer, the FORTRAN language is really quite uniform. It was designed as a machine-independent language suitable for all computers and has been widely accepted as such by computer manufacturers.

The greatest obstacle standing in the way of the wider use of computers by greater numbers of people has been the fragmentation and proliferation of noncompatible programming languages. Dr. Frederic Stuart, author of this month's Main Selection, the newly published FORTRAN PROGRAMMING, is very much an advocate of FORTRAN. In his own words, "It may be too late for all nations to agree on Esperanto--but there is still time for all computer users to agree on FORTRAN."

This month's Main Selection is a text unusually adaptable for self-tuition in FORTRAN as a universal computer programming language, usable with any computer supplied with a FORTRAN compiler. Its order of presentation is a teaching order, not that of the usual reference manual. Perhaps its most outstanding feature is its versatility, for it contains 120 practice programming exercises drawn from a wide variety of disciplines.

Whether your need is for a FORTRAN text or a reference manual suitable for shifting programs between computer models or for selecting computer equipment with regard to FORTRAN language capability, I commend FORTRAN PROGRAMMING to your attention. Of all the titles available on this subject (and there are many), only Frederic Stuart's FORTRAN PROGRAMMING contains all of these unusual features under one set of covers.

Robert L. Hart



If the boss asks, "Can you use our new computer?" will your answer be:

- (a) "Only if you provide a programmer."
- (b) "Only if it is an IBM 1620, Model II."
- (c) "Only if it uses the ZIPPY-QUIK language."
- (d) "Only if it uses FORTRAN II." or
- (e) "Only if it uses FORTRAN IV."

The stated purpose of this month's Main Selection, FORTRAN PROGRAMMING, is to provide you with the means for making the correct response:

- (f) "Yes." (unless it is a rather small computer)

This newly published volume is designed to teach you how to *use* electronic computers. The emphasis in the preceding sentence is a warning that this book is not intended to explain the workings of computers. There is no discussion of the social and economic implications of computers, nor of the electronic basis of their operation. A competent computer user has no more need for detailed information on circuits, gates, and registers than the adding-machine user has for knowledge of cams, gears, and rollers.

FORTAN PROGRAMMING departs radically from the usual order of presentation of computer manufacturers' reference manuals or of

many other texts. Instead of introducing whole categories of FORTRAN statements by listing all members of a class at once, the author introduces the reader to the simpler forms of each statement type. After practicing with these, you will be presented with additional (and frequently more elegant) statements of each type.

Thus the *control* statement is represented in Chapter 2 only by the unconditional GO TO statement; the Arithmetic IF statement is not added until Chapter 4; the DO statement appears in Chapter 5; conditional GO TO statements and Logical IF statements are deferred until Chapter 8, and CALL and RETURN statements until Chapter 9. The same gradual introduction is followed for *arithmetic* statements, *input/output* statements, *specification* statements, and *variable* types.

Since FORTRAN cannot be learned merely by reading about it, 120 practice exercises drawn from a wide variety of disciplines are included. The subject areas include simple arithmetic, elementary logic, statistics, business data processing, mathematics, engineering, chemistry, geology, physics, linguistics, and the behavioral sciences. Each problem is sufficiently self-contained (that is to say, necessary computational formulas are provided) to permit programming by readers unfamiliar with the originating discipline.

A detailed appendix provides output values ("answers") for the 120 practice exercises so that you may verify that you have followed "correct" procedures. Still another appendix summarizes and compares the major characteristics of various FORTRAN compiler programs. Twenty-five tables scattered throughout the text index specific FORTRAN statements for 152 different computer models.

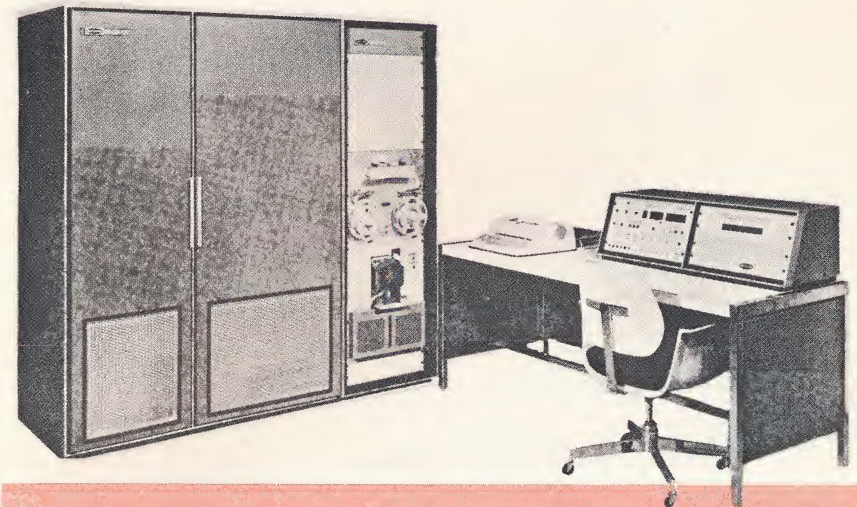
Designed for the reader without previous training as well as for the novice programmer, FORTRAN PROGRAMMING will indeed teach anyone with access to a computer how to *use*—and how to *communicate with*—electronic digital computers of every degree of complexity.

FORTRAN PROGRAMMING's reference material will facilitate:

- shifting FORTRAN programs from one computer model to another
- writing programs in FORTRAN acceptable to any computer model
- making computer rental or acquisition decisions with regard to FORTRAN capabilities
- training personnel in FORTRAN programming, regardless of what computers are on hand

Some Features of Frederic Stuart's FORTRAN PROGRAMMING:

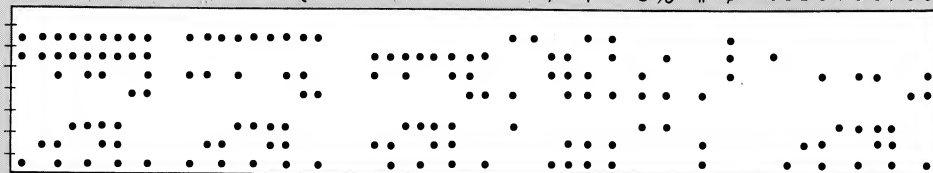
- Contains practice programming problems drawn from a wide variety of subject areas
- Includes 120 practice exercises
- Provides trial outputs for all practice exercises
- Standard data sets furnished for all exercises requiring data
- Numerous tables comparing FORTRAN for 78 compilers are provided for a total of 152 different computer models
- Not computer-based or FORTRAN-version based
- Uses a graded order of presentation featuring deferment of FORMAT and provision of a "standard" FORMAT for introductory chapters and exercises



About the Author

Frederic Stuart has been Associate Professor of Business Statistics at Hofstra University since 1963. He received his Bachelor's degree at the University of Michigan and his Master's degree and Ph.D. at Columbia University. Dr. Stuart has been a Senior Consultant to National Economic Research Associates, an Economist for the National Broadcasting Company, and an advisor to many corporations and non-profit organizations. He is the author of the widely adopted *Introductory Computer Programming*, published in 1966.

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"Dr. Stuart has done an outstanding job in this book on FORTRAN programming written both as a text and as a reference. It is designed for use with any computer for which FORTRAN is available. Twenty-five reference tables appear throughout the text to implement the inter-computer applicability, which index specific FORTRAN statements for 152 computer models. The presentation of material is done by a logical introduction to simpler forms of FORTRAN statements, then building on these until the student has knowledge of all types and all complexities, with compiler differences noted in text and table. FORTRAN cannot be learned by reading, so the author has included 120 practice exercises from a variety of disciplines, including arithmetic, statistics, physics, geology, chemistry, elementary logic, linguistics, engineering mathematics, behavioral sciences, and business data processing. These Exercises outline problems for which complete FORTRAN programs may be written. To assist both the teacher and student in the debugging and testing of student programs, correct "output" for each exercise appears in Appendix A. A standard data set consisting of 20 punched cards is listed at the beginning of Appendix A for use with the exercise programs requiring data. Though the student will generally learn only the FORTRAN for the computer model he has available, he will at the same time see that he is learning a more "universal" programming language. With slight modification in some statements, his programs can be compiled and run on other computer models. Dr. Stuart is to be congratulated on this book, which could become a "standard text" on FORTRAN and an indispensable reference book for any programmer's library. **Highly recommended.**"

—Science Books

quarterly review of the
American Association for the Advancement of Science

The Main Selection:

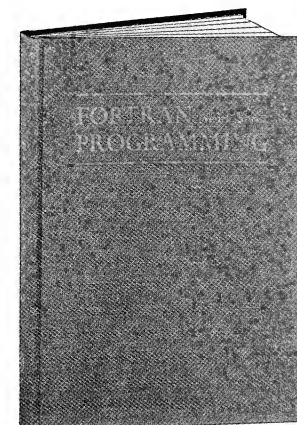
FORTRAN Programming

by Frederick Stuart

Retail Price \$7.95

Member's Price \$6.75

Plus one bonus credit toward the four
required for your next free Bonus Book



Alternate Selection:

Techniques of System Engineering

by Stanley N. Shinnars

Today's complex social and technological problems have given rise to a new discipline—systems engineering. The successful systems engineer is at one and the same time a competent engineer, an economist, and a manager. As an engineer he must know theory, applications, reliability, and testing techniques. As an economist and manager, the systems engineer must know how to plan and control the fiscal and schedule aspects of a program. In addition, as a manager he must be able to communicate ideas and concepts to both superiors and subordinates in a clear and convincing manner.

TECHNIQUES OF SYSTEM ENGINEERING has been written to provide readers with these capabilities. The author, Stanley M. Shinnars, is uniquely fitted to create such a broadly interdisciplinary volume, for he is able to draw not only upon his own wide industrial experience but also upon an extensive background in both university and industrial teaching programs. In addition to serving as Research Section Head with the Sperry Gyroscope Company, he is also Adjunct Professor of Electrical Engineering at the Polytechnic Institute of Brooklyn.

Since most modern complex systems rely strongly on feedback elements in their operation, Professor Shinnars' book focuses

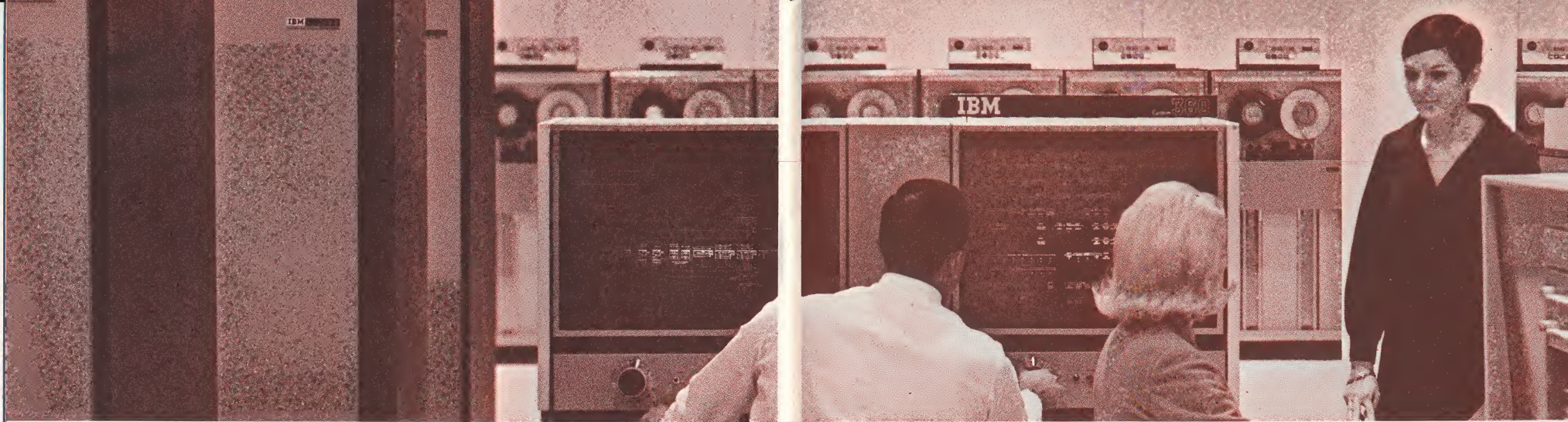
About the Author:

Stanley M. Shinnars is a Research Section Head at the Sperry Gyroscope Company, where he is active in the research, development, design, and management of systems in the areas of command and control, optimal control, space, fluidics, tracking radars, and the mathematical representation of man-machine interfaces. He also lectures on these subjects at the Polytechnic Institute of Brooklyn and The Cooper Union School of Engineering and Science. The author of the authoritative text, *Control System Design*, and dozens of technical papers, Mr. Shinnars is a Senior Member of the IEEE.

attention on systems engineering in the light of control theory. Although control theory does not solve every systems engineering problem, it can provide a powerful framework on which to build. Users of TECHNIQUES OF SYSTEM ENGINEERING will be in a unique position to solve systems-oriented problems utilizing block diagrams, feedback control theory, computers, simulation, and modeling.

Two-thirds of this big, 500-page volume are given over to *basic systems concepts*, while the remaining one-third is devoted to *practical systems applications*. Among the fundamental and basic topics covered are:

- procedures for engineering a system
- concepts of system behavior
- deterministic and probabilistic system errors with techniques for analyzing them, including Monte Carlo methods
- methods for predicting system reliability and techniques for improving it, such as integrated circuits and redundancy
- management control of system scheduling and cost through the use of time models such as PERT, mathematical models, and computers
- system optimization utilizing differential calculus, the search method, linear programming, non linear program-



ming, the classical matrix method, variational calculus, Bellman's dynamic programming, and Pontryagin's maximum principle

- testing techniques emphasizing computer methods for analyzing test data

Among the practical applications of analytical system design techniques to present-day problems presented in *TECHNIQUES OF SYSTEM ENGINEERING* are:

- the design of instrumentation tracking radars
- the synthesis of attitude control systems for space vehicles
- the new technology of fluidic systems, which offer advantages of reliability, low cost, and the ability to operate under severe environmental conditions
- the creation of high-speed commercial transportation systems

Drawing upon his own extensive experience, the author describes in detail the problems and the theory and solutions utilized in achieving such modern systems as the Japanese high-speed Tokaido railroad, the Federal Aviation Agency's air traffic control system at Islip, N. Y., the Toronto

computerized automobile traffic control system, the 407L Tactical Air Control System, and the UNIVAC Fluidic Computer. (The concept of using air and other fluids to perform functions ordinarily done by electronic devices is exciting widespread interest. Fluids have been used in control systems for everything from rockets and satellites to heart pumps.)

One of the most interesting and challenging chapters in *TECHNIQUES OF SYSTEM ENGINEERING* is that which considers the role of the human element in systems. The proper design of man-machine systems requires as much understanding of the characteristics of human controllers as of the nature of machines.

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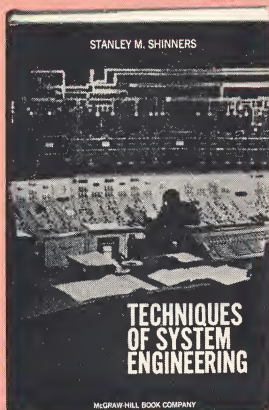
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